

CLAIMS

What is claimed is:

- 1 1. A device for modulating a carrier signal comprising:
2 (a) a mapper generating a first data signal at a selected one of a plurality
3 of baud rates;
4 (b) a scaler multiplying the first data signal by one of a plurality of
5 predetermined scaler values selected to correspond to the baud rate to generate a
6 scaled data signal;
7 (c) a complex mixer for generating a frequency shifting scaled data signal;
8 (d) an upsampler circuit for increasing the sampling frequency of the
9 frequency shifted scaled data signal; and
10 (e) a pulse shaper circuit for generating a digital representation of a
11 modulated carrier signal in accordance with the frequency shifted scaled data signal.
12
- 1 2. The device for modulating a carrier signal of claim 1, wherein the first data
2 signal comprises an I-channel first data signal and a Q-channel first data signal, the
3 scaled data signal comprises an I-channel scaled data signal and a Q-channel
4 scaled data signal, and the frequency shifted scaled data signal comprises an I-
5 channel frequency shifted scaled data signal and a Q-channel frequency shifted
6 scaled data signal.
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- 1 3. The device for modulating a carrier signal of claim 2, wherein the first data
2 signal is a digital data signal with a sampling frequency corresponding to the highest
3 of the plurality of baud rates.
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- 1 4. The device for modulating a carrier signal of claim 3, wherein each of the
2 predetermined scaler values is a value which provides for the scaled data signal to
3 have approximately the same signal strength independent of baud rate.
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1 5. The device for modulating a carrier signal of claim 4, wherein the complex
2 mixer includes:

3 (i) a first multiplier and a second multiplier each multiplying the I-
4 channel scaled data signal by a sine waveform and a cosine waveform
5 respectively;

6 (ii) a third and fourth multiplier each multiplying the Q-channel
7 scaled data signal by the sine waveform and a cosine waveform respectively;

8 (iii) a first summer adding the result of the second multiplier to the
9 result of the third multiplier multiplied by negative one to generate the I-
10 channel frequency shifted scaled data signal; and

11 (iv) a second channel summer adding the result of the first multiplier
12 and the result of the fourth multiplier to generate the Q-channel frequency
13 shifted scaled data signal.

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1 6. The device for modulating a carrier signal of claim 5, wherein the sine
2 waveform and the cosine waveform each have a frequency of one fourth the
3 sampling frequency.
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1 7. The device for modulating a carrier signal of claim 6, wherein the pulse shaper
2 circuit includes a finite impulse response filter and a coefficient matrix storing a set of
3 coefficients for each of the I-channel and the Q-channel.
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1 8. The device for modulating a carrier signal of claim 7, wherein the plurality of
2 baud rates are 2 Mbaud and 4 Mbaud and the sampling frequency is 4 MHz.
3

1 9. The device for modulating a carrier signal of claim 8, wherein the
2 predetermined scaler values are a value of 1 corresponding to the 2 Mbaud baud
3 rate and a value of 2/3 corresponding to the 4 Mbaud baud rate.
4 complex

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1 10. The device for modulating a carrier signal of claim 9, wherein the finite
2 impulse response filter is a 16 tap finite impulse filter and each set of filter
3 coefficients includes 9 non-zero coefficients, each coefficient being a 10 bit
4 coefficient.

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1 11. A method for modulating a carrier signal, the method comprising:
2 (a) generating a first data signal at a selected one of a plurality of baud
3 rates;
4 (b) scaling the first data signal by one of a plurality of predetermined scaler
5 values selected to correspond to the baud rate to generate a scaled data signal;
6 (c) mixing the scaled data signal with a frequency signal to generate a
7 frequency shifted scaled data signal;
8 (d) increasing the sampling frequency of the frequency shifted scaled data
9 signal; and
10 (e) filtering the frequency shifted scaled data signal to generate a digital
11 representation of a modulated carrier signal.

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1 12. The method for modulating a carrier signal of claim 11, wherein the step of
2 generating the first data signal comprises generating an I-channel first data signal
3 and a Q-channel first data signal, the step of scaling the first data signal comprises
4 scaling the I-channel first data signal and the Q-channel first data signal, and the
5 step of mixing the scaled data signal includes complex mixing of both the I-channel
6 scaled data signal and the Q-channel scaled data signal.

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1 13. The method for modulating a carrier signal of claim 12, wherein the first data
2 signal is a digital data signal with a sampling frequency corresponding to the highest
3 of the plurality of baud rates.

1 14. The method for modulating a carrier signal of claim 13, wherein each of the
2 predetermined scaler values is a value which provides for the scaled data signal to
3 have approximately the same signal strength independent of baud rate.
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1 15. The method for modulating a carrier signal of claim 14, wherein the step of
2 complex mixing the scaled data signal includes:

3 (i) subtracting the result of the Q-channel scaled data signal
4 multiplied by a sine waveform from the result of the I-channel scaled data
5 signal multiplied by a cosine waveform to generate an I-channel frequency
6 shifted data signal; and

7 (ii) adding the result of the Q-channel scaled data signal multiplied
8 by a cosine waveform from the result of the I-channel scaled data signal
9 multiplied by a sine waveform to generate a Q-channel frequency shifted data
10 signal.
11

1 16. The method for modulating a carrier signal of claim 15, wherein the sine
2 waveform and the cosine waveform each have a frequency of one fourth the
3 sampling frequency.
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1 17. The method for modulating a carrier signal of claim 16, wherein the step of
2 filtering the frequency shifted scaled data signal includes 16 tap finite impulse
3 response filtering utilizing a set of predetermined filter coefficients for each of the I-
4 channel and the Q-channel.
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1 18. The method for modulating a carrier signal of claim 17, wherein the plurality of
2 baud rates are 2 Mbaud and 4 Mbaud and the sampling frequency is 4 MHz.
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1 19. The method for modulating a carrier signal of claim 18, wherein the
2 predetermined scaler values are a value of 1 corresponding to the 2 Mbaud baud

3 rate and a value of $2/3$ corresponding to the 4 Mbaud baud rate.

4 complex

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1 20. The method for modulating a carrier signal of claim 19, wherein each set of
2 filter coefficients includes 9 non-zero coefficients, each coefficient being a 10 bit
3 coefficient.

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